Acta Biologica Szeged. 27 (1—4), pp. 79—88 (1981)

COMPARATIVE WEED INVESTIGATIONS IN WHEAT AND MAIZE CROPS CULTIVATED TRADITIONALLY AND TREATED WITH WEEDICIDES
VI. THE FORMATION OF WEED VEGETATION OF WHEAT CROPS CULTIVATED IN PARTIAL MONOCULTURE UNDER TRADITIONAL AND CHEMICALIZED CIRCUMSTANCES

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(Received June 20, 1980)

Summary

Between 1963 and 1965 I made weed investigations in wheat crops cultivated traditionally, sprayed with different phenoxy-acetic acid-derivatives (2.4-D; 2.4-D amin; MCPA amin), moreovein wheat crops under the after-effect of Simazin resp. Atrazin, in 5 units of 3 state farms (Mezőnagyr mihály, Enying, Lábod). The green crop in the majority of the surveyed areas was wheat. In 2 of the 3 surveyed farms weed survey took place during the first country-wide survey (1950) too.

We can establish from the results of the investigations as follows:

As a result of application of modern large-scale agrotechnics the weed cover has remarkably decreased in wheat crops cultivated traditionally during the last 12—15 years compared to that of 1950. The decrease is on a larger scale at perennials than at annuals.

In monoculture the overgrowing with weeds of wheat crops — under traditional as well as chemicalized circumstances — is stronger than in crop change. In monoculture annuals have multiplied in greater amount altough occasionally perennials did it too.

On the areas standing under after-effect of Simazin resp. Atrazin we can count with harmful aftermaths even in the 3rd year after the spray. The crop damage caused by the after-effect resulted 20—60%. Overgrowing with weeds as compared to the control and this resulted in the harvest as well.

In the 4nd, year after the spray no damage appeared in wheat crops; its harvest, weed cover and the number of species corresponded to those of wheat crops cultivated traditionally. Because of the long-lasting persistence of Simazin resp. Atrazin in dose 5—7 kg/c.y. wheat can be cultivated safely only in the 4nd year after the spray.

Introduction

The structural changes taken place in Hungarian agriculture resulted in the use of modern large-scale agrotechnical processes including the chemical processing of agriculture among others the use of different herbicides. Of the latter from 1959 and the early 60-s chlor-amino-triazines have been used because of their long-lasting persistence the maize had to be cultivated for some years after itself. As a result of this a part of wheat crops was cultivated in monoculture in the majority of the farms. The industrial systems of production expanding quickly since the middle of 70-s have also resulted the change of crop structure and increase of *monocultural cultivation.*

Naturally this facts in all effected in weed veaetation's quantitative and species-composition. So their investigation possibly in the same areas within several years was obvious. It was necessary since at the beginning of the investigation we haven't data concerning these. Since that time a number of papers were published concerning

the details of this subject as well as the effect of large-scale agrotechnics and herbicides but there is a shortage in data concerning the weed vegetation of wheat crops cultivated in monoculture furthermore that of wheat crops in areas treated with Simazin resp. Atrazin for maize in the preceding year — as far as home-relations — are concerned. Namely during the last 15 years none of the papers concerning weed vegetation of wheat crops examined it in monocultures; the wheat crops sown in areas treated with Simazin resp. Atrazin in the preceding year were discussed only from the view point of damage of cultivated plant (I'só, 1962, 1966) but data concerning their weed vegetation weren't published.

Investigated places and methods

Weed investigations were carried out in Mezőnagymihály, Enying and Lábod between 1963 and 1965 in wheat crops cultivated traditionally, sprayed with Dikonirt (2,4-D), Dikamin (2.4-D amin), Dikotex 40 EC (MCPA amin) and in *wheat crops* standing under after-effect of Simazin resp. Atrazin. In the wheat crops cultivated traditionally as well as in crops sprayed with different phenoxy — acetic acid-derivatives — according to the possibilities — surveys in 2 and 3 years old monocultures as well as in monocultures under crop change were made so some of the areas were partly or totally identical during the time of investigation (between 1963 and 1965), (for example the plot standing under after-effect of Atrazin in Enying). In 2 of the 3 surveyed farms in Mezőnagymihály and Lábod weed survey happened during the first country-wide survey too (ÚJVÁROSI, 1950).

The basic surveys as well as the surveys between 1963 and 1965 were made in June with the area-expressive coenological method of BALÁZS on soils field-adobe (Mezőnagymihály—Klementina; Enying), clayey-adobe (Mezőnagymihály—Baglyas), adobe resp. partly sandy adobe (Lábod—Nagybaráti, Lábod—Nagykorpád). In every investigated places and in the units of every single state fram I made separate survey-series in crops cultivated traditionally and sprayed with different herbicides, and this survey-series were analyzed annually everywhere according to every single treatment. Concerning the number of surveys, their distribution in every single plot is reported in the publication No. V. From the average of survey-series of these places the first 15 weed species occuring in the greatest amount with their percental cover-calues in the Tables 1—3 are indicated. The tab bles — according to every single treatment annually — contain the number of weed-species, the total cover of weeds and the results of mathematical statistical analyzis. The main groups of the distribution of weed vegetation according to their life forma are shown in the Figure 1—3.

As far as precipitation is concerned the weather was very dry in the investigated places in 1950. 1963 and 1964 were years with average amount of precipitation but 1965 vas a very wet year with 250—500 mm exceeding the average of 40 years. In 1963 the time of spray was the first week of Mai because of the late spring still in 1964 and 1965 it was the middle of April. The dose of herbicides was: Dikonirt: 1.3 kg/c.y.; Dikamin: 2 1; Dikotex: 40; EC: 2.2 kg/c.y.

The areas of wheat crops sown in plots treated with Simazin resp. Atrazin for maize in the őrecedomg years were sprayed with 7 kg/c.y. Simazin in Mezőnagymihály in spring of 1961. In Enying on one part of the nivestigated plots in autumn 1960, on the other part in spring of 1961 5—5 kg/c.y. Simazin resp. Atrazin were applicated, in addition in 1961 and 1962 — when maize was cultivated on these areas — 1.1 kg—c.y. Dikonirt. I. investigated the wheat crops sown in these areas during 3 subsequent years. The wheats standing under after-effect of Simazin resp. Atrazin were treated with Dikonirt only in Mezőnagymihály. In 1964 the latter areas were not sprayed with weedicides but in 1965 Dikotex 40 EC was applicated.

Results and discussion

1. Weed vegetation of wheat crops of State Farm at Mezőnagymihály

Weed investigations were carried out in the next units of the farm: Bagjas and Klementina in wheat crop cultivated traditionally sprayed with Dikonirt Dikamin Dikotex 40 EC, and in wheat crops standing under aftereffect of Simazin. The surveys

of wheat crops cultivated traditionally in 1963 were made in the plots of cooperative farms being near Mezőkövesd—Mezőkeresztes the others in 2 further units of the state farm.

On the area of wheat plots treated with Dikonirt in 1963 wheat was cultivated in the previous year too. The area of the crop trested with Dikotex 40 in 1965 also was also identical with the wheat sprayed with Dikamin in the previous year. In the plots treated with Simazin for maize during the previous years also wheat was cultivated in 2 subsequent years.

a) Weed-vegetation of wheat cultivated traditionally:

At the time of 1963 resp. 1965 surveys its weed cover was considerably smaller as compared to that of 1950, although weed covered still great areas. The changes of weed vegetation are testified by significance investigations too (Table 1). The distribution of weed veaetation according to life forms and the changes are shown by the Figure 1.

The considerable decrease of group T_2 is obvious on the figure at the same time T_3 but expecially T_4 have multiplicated so that the total cover of therophyta life form didn't change considerably compared to that of 1950. On the contrary the quantity of perennial radiciform couch-grasses (G_3) has considerably decreased. The changes were verified by mathematical statistical analyzis because geophyta life form including the cover of group G_3 differs significantly from that of 1950, but at the therophyta life form resp. its certain groups the S.D. values differed 40—90% in positive or negative direction.

The quantitative changes of most frequent weed species are shown in Table 1. Obviously from among annuals the typical eared weeds were totally repressed as well as the most harmful perennials but at the same time among annuals and perennials we can find some species multiplaying for example Sinapis, *Stachys, Bilderdykia* and *Rubus*.

b) Weed vegetation of wheat crops treated with different phenoxy-aceticacid-derivatives

Table 1. shows that under different cultivation-circumstances different weedicide effect is produced even by homotypical chemicals. As it has been mentioned the green crop of crops sprayed with Dikonirt and Dikotex EC 40 was wheat, so in these plots the overgrowing with weeds was much stronger and the effect of herbicide couldn't be felt so much as in changed crops treated with Dikamin. The effect of 3 weedicides on every single life forms and their groups is shown also by Figure 1. (The data of wheat crops treated with Dikotex 40 EC by mistake are indicated as treated with Dikonirt). As it is visible Dikamin reduced to nothing all weed groups characteristic for wheat crops, on the other hand the other 2 herbicides destroyed first of all the weeds of group T_2 and T_3 and they had less effect on the others. In wheat treated with Dikonirt the greater amount of group T_3 was caused by the multiplication of *Fumaria*. Table 1. shows the effect of investigated herbicides on every single weed species.

c) Weed vegetation of wheat crops standing under aftereffect of Simazin:

The state farm cultivated wheat on the investigated plots in the 3rd and 4nd years after spraying with Simazin. The results of the first year of investigation (1963)

have already been published discribing the damage of crops and as a result of this their considerable overgrowing with weeds (FEKETE 1964 manuscript, published in 1973). In the 4nd year after the spraying (1964) the crop wasn't damaged and its weed cover was only 10% (Table 1).

Table 1. More frequent weed species of wheat crops of Mezőnagymihály State Farm with their cover values in the years 1963—1965

Units:	Field-mean:	Klementina unit:			Bagjas unit:				
Treatments:		Tradi-tional	Dika-min	Tradi-tional	Díko-nirt	Simazin aftereffect in 1961		Dika-min	Diko-tex 40
Time of investigation:	1950	1963	1964	1965	1963	1963	1964	1964	1965
	VI. 14.	VI. 16.	VI. 9.	VI. 29.	VI. 17.	VI. 17.	VI. 8.	VI. 8.	VI. 28.
Rubus caesius	0.63	1.53	0.37	2.37	0.79	3.12	3.12	0.19	0.84
Lathyrus tuberosus	0.94	0.41	0.04	0.02	0.30	2.12	0.92	0.04	0.38
Convolvulus arvensis	12.81	3.15	0.17	4.50	2.85	3.76	1.64	0.07	0.58
Stachys annua	0.08	2.40	—	—	0.12	0.07	0.99	—	1.26
Fumaria scleicheri	—	0.08	—	0.04	3.51	0.27	—	—	0.01
Sinapis arvensis	0.06	3.57	—	3.19	0.16	—	0.03	0.01	0.02
Lepidium draba	4.00	0.22	0.66	0.72	—	—	—	—	—
Thlaspi arvense	2.32	0.09	0.16	0.06	—	—	—	0.15	0.01
Cirsium arvense	0.06	1.62	0.03	2.06	1.26	0.04	0.06	0.31	0.49
Chenopodium album	0.13	0.86	0.03	0.06	0.50	1.62	0.21	0.01	0.01
Anagallis arvensis	—	0.09	—	0.02	0.13	0.69	0.05	0.01	1.01
Polygonum aviculare	0.72	0.35	0.01	—	—	—	0.01	—	0.08
Bilderdykia convolvulus	0.22	1.31	0.01	2.54	—	0.12	0.20	0.01	1.90
Echihochloa crus-gallia	0.10	0.21	0.03	0.02	1.46	16.25	0.32	0.01	0.02
Setaria viridis	0.29	0.17	0.01	0.39	2.30	0.31	0.15	—	0.50
Total weed cover:	29.01	20.20	1.82	18.46	15.75	33.38	10.01	1.66	11.75
Number of weed species:	34	53	13	30	34	36	27	20	38
S. D. concerning the total weed cover:		80%	differs		95%	differs		differs	95%
total number of species:		98%	differs		differs	80%		differs	differs
S. D. concerning the treatments in the units and between units (in the same year)								20% 10%	
S. D. comparison of years:			40% identi-cal				differs differs		40% 10%

For comparison I indicated the results of 1963 weed investigations as well in the Table and Figure; showing that at that time the late summerweeds (T_4) multiplicated in greater amount but in the next year because of the necessary density of crops they were quite repressed. The perennial radiciform couch-grasses (G_3) also covered greater area here than in crops cultivated traditionally and their amount was esetially the same in both years (Fig. 1).

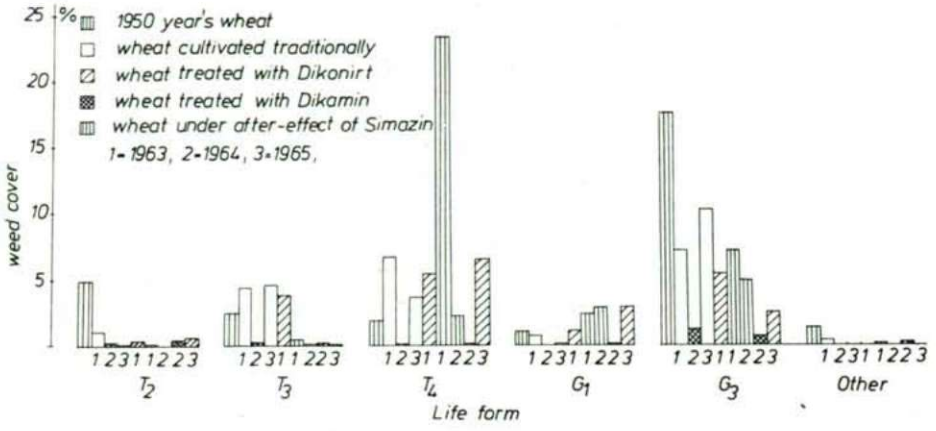

Fig. 1. Distribution of weed vegetation according to life forms in wheat growing traditonally, treated with fenoxiacetic acid derivates and under Simazin post-effect; in the Mezőnagymihály State Farm.

2. Weed vegetation of wheat crops of Enying State Farm

In autumn of 1962 the farm sowed wheat into 2 greater areas standing under after-effect of Simazín resp. Atrazin, in which in 1964, in some plots in 1965 also wheat was cultivated. I had been investigating this plots for 3 years. The doses of weedicides applicated on the areas see in part: "Methods". Surveys were made in untreated wheat crops cultivated in crop change of the local cooperative farm in 1963 and that of the state farm in 1964 for the sake of comparison of their weed vegetation.

a) Weed vegetation of wheat cultivated traditionally:

In 1963 the cooperative farm cultivated italian wheat. This race is much more senssitive to cold so its stand became thinner and got very weedy. Next year the crops had quite low weed cover so comparing the 2 years weed quantities remarkable differences can be spotted (Table 2).

The distribution of weed vegetation according to their life forms is shown in Figure 2.

The mass-occurence of annuals including the late summer species (T_4) and the radiciform perennial couchgrasses (G_3) is characteristic to the weed vegetation of wheats cultivated traditionally in 1963. The perennial couch-grasses (G_1) didn't cover big area, butthey are considerable first of all because of Sorgum halapense which is one of the caranteen-weeds in Hungary. This has been the first data of its occurence on cultivated areas. Next year — because of the sufficient density of crops — all weed groups were limited to small area. In 1963 among annuals Ambrosia elatior occured in great amount, among perennials Rubus caesius and Convolvulus arvensis. In 1964 all species covered much less area (Table 2).

b) Weed vegetation of wheats standing under after-effect of Simazin resp. Atrazin:

Results of the first investigation-year of wheat crops standing under after-effect of Simazin resp. Atrazin have elredy been published (FEKETE, 1964 manuscript, publi-

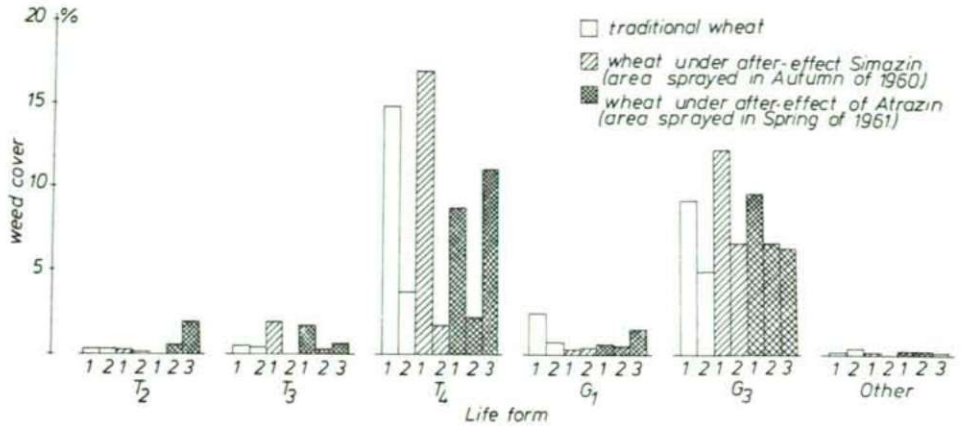

Fig. 2. Distribution of weed vegetation according to life forms in wheat growing traditionally and under Simazin resp. Atrazin post-effect, in the Enying State Farm.

Table 2. More frequent weed species of wheat crops in Enying Statefarm with their cover values in the years 1963—1965

Treatment:	Traditional		After-effect of Simazin Autumn of 1960		After-effect of Atrazin Spring of 1961		Dikotex 40
Time of surveys:	1963	1964	1963	1964	1963	1964	1965
	VI. 26.	VI. 22.	VI. 26.	VI. 22.	VI. 26.	VI. 22.	VI. 24.
Rubus caesius	4.81	2.18	10.31	5.50	6.12	3.94	5.01
Lathyrus tuberosus	1.33	0.11	0.29	0.27	0.01	0.02	1.45
Convolvulus arvensis	3.26	2.61	1.88	1.15	3.51	2.65	1.31
Ajuga chamaepitys	0.99	0.08	0.03	0.01	0.20	0.22	0.01
Stachys annua	1.52	0.81	4.61	0.53	2.43	0.89	3.24
Melampyrum barbatum	0.43	0.06	1.71	—	0.27	0.02	0.08
Papaver rhoeas	0.02	0.07	—	—	—	0.32	1.46
Sinapis arvensis	0.04	0.29	0.12	—	1.41	—	0.44
Ambrosia elatior	9.21	1.26	7.26	0.08	4.01	0.01	3.50
Cirsium arvense	1.06	0.16	0.01	0.01	—	0.08	—
Chenopodium album	0.25	0.19	1.17	0.17	0.39	0.12	0.16
Anagallis arvensis	1.08	0.33	0.06	—	0.25	0.03	1.92
Bilderdykia convolvulus	0.48	0.36	0.09	0.33	0.07	0.32	1.13
Echinochloa crus-galli	0.16	0.08	0.60	0.05	0.01	0.06	0.02
Setaria viridis	0.20	0.21	2.36	0.38	0.81	0.11	0.09
Total weed cover:	27.24	10.12	31.40	8.81	20.62	10.26	21.37
Number of weed species:	36	42	26	22	31	38	39
S. D. concerning the total weed cover:		differs	70%	70%	80%	identical	differs
the number of species:		differs	differs	differs	differs	90%	10%
S. E. in comparison of years:				differs 99%	10% 95% (1963—1965)	98% 40%	differs 80%
S. D. between the identical treatments:		differs differs	95% 50%	30% 90%	95% 50%	30% 90%	

shed in 1973). For the sake of comparison the results of investigations in 1963 are also ndicated in the present paper (Table 2. and Fig. 2). Obviously the plots treated with Simazin in autumn 1960 were much more weedy than the plots treated with Atrazin in spring 1961, in which the crop — in contradiction with those sprayed in autumn of 1960 — has less damage.

Next year (1964) no demage was noticed neither in crops being in the areas treated in autumn 1960, nor in those treated in spring 1961. Their stand closed perfectly with sufficient density and with quite low weed cover which corresponded with the stand of crops cultivated traditionally. In 1965 I investigated only the crops being in the areas sprayed in spring 1961 with Dikotex 40 EC. Because of the monocultural cultivation having lasted for 3 years it was impossible to repress weeds even with herbicides (Table 2, area sprayed in 1961, surveyed in 1965). Mathematical-statistical analyzis gave the results indicated in Table 2. concerning the total weed cover and the number of species on the investigated areas in comparison with crops cultivated traditionally, the plots under after-effect of Simazin resp. Atrazin were comparised with each other and the data of previous year of the same areas.

Comparing the distribution of weed vegetation according to life forms (Fig. 2) it can be established that in the first investigated year the late-summer weeds (T_4) and perennial radiciform couch-grasses (G_3) multiplicated in greater amount especially in plots sprayed in autumn 1960. Next year as a result of weedrepressive effect of wheat all weed groups were repressed back. However in the last investigated year (in 1965) in the crop with rather thin stand in spite of chemical treatment the annuals were in great amount again first of all the late-summer weeds. So in these plots the life form T reached its highest cover value which possibly can be the result of monoculture lasted 3 years. In the plots standing under after-effect of Simazin resp. Atrazin — similarly to the traditional — there were Rubus caesius, *Convolvulus arvensis* and *Ambrosia elatior* in great amount (Table 2).

3. Weed vegetation of wheat crops in Lábod State Farm

Weed investigations were made in Nagybarát and Nagykorpád units of the state farm in wheat crops cultivated traditionally and sprayed with Dikonirt. In the majority of the investigated plots wheat had been cultivated for 2 or 3 years.

a) Weed vegetation fo wheats cultivated traditionally:

In 1950 at the time of the first country-wide survey they were the most weedy wheat crops of the country. By 1963 resp. 1965 large-scale decrease of weed cover had taken place. In spite of 68—70% cover decrease the crops haven't been satisfactorily free of weeds yet (Table 3).

As compared the weed vegetation according to life forms we experience the next (Fig. 3).

During the first country-wide survey in the wheat crops of these areas the annuals (52,98%), from among the perennials the couch-grasses (G_1) have been in enornous amount. According to the 1963 resp. 1965 investigations both life forms were present with 1/3, 1/4 of their former amount in spite of this the cover of annuals can be considered still high, which can be explained possibly with the partial monocultural cultivation of wheat crops. The cover of the 2 important life form (T, G) is shown by Fig. 3, from which the degree of decrease can be established. This changes were verified by mathematical statistical analyzis.

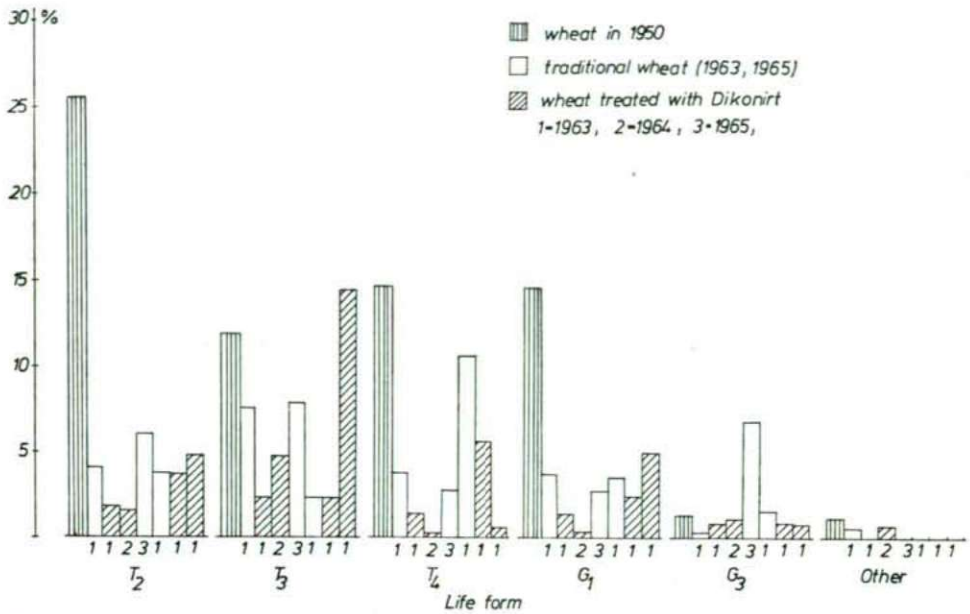

Fig. 3. Distribution of weed vegetation according to life forms in wheat growing traditionally and treated with 2.4-D.

The area-occupation of more frequent weed species is shown in Table 3. — so the changes can also be followed. Like the other investigated places very considerable decrease has taken place at the majority of them, at the same time *Raphanus raphanistrum, Anthemis arvensis, Agropyron repens* occassionally multiplicated, dan by 1965 *Scleranthus annuus* had also reached considerable amount.

b.) Weed vegetation of wheats treated with Dikonirt:

In the whest crops sprayed with Dikonirt as an effect of weedicides 45—50% decrease of weed cover had taken place (In Table 3. wheats treated with Dikonirt in 1963 and 1964 in Nagybarát unit). On the other hand in Nagykorpád unit the decrease is only 30%.

Comparing each life form it can be establish that Dikonirt decreased the total cover of annuals to 1/3 in both years. The effect of herbicide resulted in every group of annuals 55—70% differences in the cover.

On the other hand in Nagykorpád the weeds of T_2 and T_3 groups occure in the same amount as traditionally and late summer weeds shot up after weedicide effect's passing also had heveloped by that time. The damage of more frequent weed species caused by Dikonirt is shown by the suitable colums of Table 3.

The effect of Dikonirt wasn't clear-cut at hardies in soil (G).

The third years wheat monoculture of the state farm in 1963 in worth mentioning, its weed vegetation can be found in Table 3. and Fig. 3. in the last column. Obviously in this areas in spite of spray with Dikonirt weeds covered much greater areas than in traditionally cultivated wheats. Especially the early summer weeds shot up in

spring (T_3, Fig. 3) first of all Viola arvensis occured in greater amount. From among perennial couch-grasses (G_1) the multiplication of *Agropyron repens* calls attention to the draw-backs of monoculture.

According to mathematical statistical analyzis Dikonirt resulted in the weed cover of wheats 95—99% singificant differences at therophyta life form resp. its groups while 50—80% differences at geophyta life form resp. itsgroups as compared with wheat crops cultivated traditionally. According to the number of species the same differences resp. deviations occured.

Table 3. More frequent weed species of wheat crops in Lábod State Farm with their cover values in hte years 1963—1965

Units:	Field-mean:	Nagybarát unit:				Nagykorpád		3 years old mono-culture
Treatments:		Trad.	Diko-nirt	Diko-nirt	Trad.	Trad.	Diko-nirt	Diko-nirt
Time of the investigation:	1950	1963	1963	1964	1965	1963	1963	1963
	VI. 19.	V. 31.	V. 31.	VI. 11.	VI. 22.	VI. 27.	VI. 27.	V. 31.
Equisetum arvense	14.65	3.07	2.50	—	—	3.12	2.20	0.37
Vicia hirsuta	8.37	0.10	—	—	—	0.49	0.04	—
Convolvulus arvensis	1.25	0.31	0.95	1.03	4.27	1.40	0.87	0.70
Raphanus raphanistrum	—	3.76	0.03	—	0.02	—	—	0.07
Viola arvensis	0.97	0.29	0.60	0.12	0.50	0.19	0.22	9.43
Ambrosia elatior	8.81	2.19	0.90	0.08	2.25	6.70	4.72	0.10
Anthemis arvensis	2.66	0.11	0.13	0.48	4.03	0.04	0.20	2.78
Centaurea cyanus	7.94	3.23	1.30	0.06	0.33	1.59	1.26	1.53
Scleranthus annuus	10.97	3.03	1.62	5.26	7.29	1.81	1.93	4.97
Chenopodium album	0.04	0.11	0.06	—	—	1.15	0.05	0.02
Rumex acetosella	0.13	—	—	0.06	2.78	0.01	0.06	
Polygonum aviculare	1.53	1.42	0.04	0.01	0.01	0.19	0.26	0.43
Agropyron repens	0.06	0.99	2.57	1.47	0.32	0.07	0.25	3.69
Apera spica-venti	1.28	0.06	0.17	0.52	1.42	1.26	1.73	0.93
Echnochloa crus-galli	1.37	0.01	0.08	0.02	0.03	0.78	0.26	0.06
Total weed cover %:	69.57	20.52	11.67	10.50	24.10	22.22	15.69	26.53
Number of all weed species:	47	38	23	24	27	32	31	24
S. D. concerning the total weed cover:		differs	95%	98%		differs	95%	differs
the total number of species:		differs	98%	99%		differs	80%	98%
S. D. between the identical treatments:					95% differs		90% 98%	99%
between years concerning the same data:				50% identi-cal	95% differs			differs 99%

References

FEKETE R. (1963): Változások a szántóföldi gyomnövényzetben (Changes in the weed vegetation on cultivated land). MTA Agrártud. Oszt. Közl. *22*, 377—393.

FEKETE, R. (1964): Comparative weed — investigations in wheat and maize crops cultivated traditionally and treated with chemical herbicides (Manuscript, transcribed in the form of a doctoral dissertation 1967, submission and defence 1972; some chapters were published 1973—1975).

FEKETE, R. (1973): Comparative weed investigations in wheat and maize crops cultivated traditionally and treated with weedicides. I. Changes in the weed vegetation of wheat crops. — Acta Biol. Szeged, *19*, 3—11.

I'SÓ K. (1962): Utóhatás-kísérletek őszi búzában klóraminotriazinokkal kezelt kukorica után (After-effect experiments in winter wheat after maize treated with cloro-aminotriazines). — Kukoricaterm. Kísérl. 1958—1960, 348—354.

I'SÓ I. (1966): Utóhatás-kísérletek gabonafélékkel különböző triazinokkal kezelt kukorica után (After-effect expreiments with cereals after maize treated with various triazines). — Kukoricaterm. Kísérl. 1961—1964, 348—354.

UBRIZSY G. (1958a): Cönológiai kutatások agrárterületek gyomtársulásain, különös tekintettel a vegyszeres gyomirtás flóraátalakító hatására. (Coenological investigations of the weed coenoses of agricultural areas with particular regard to the floratransformative effects of chemical weed — killers). — MTA Biol. Csop. Közl. *2*, 65—78.

UBRIZSY G. (1958b): Vegyszeres gyomirtás gabonavetésekben (Chemical weed-killing in corn crops). — MTA Agrártud. Oszt. Közl. *14*, 339—411.

ÚJVÁROSI M. (1950): Hol milyn gyomok ellen védekezzünk? (Wich weeds to protect against where?). — Debreceni Mezőgazd. Kis. Int. Évk. *1*, 27—105.

ÚJVÁROSI M. (1961): A búzavetések gyomnövényzete. Búzaterm. kísérl. 1952—1956 (Weeds in wheat crops. Experiments in wheat-growing, 1952—1956). — Budapest.

ÚJVÁROSI M. (1973): Gyomnövények, Gyomirtás I—II. (Weeds and their elimination I—II). — Budapest.

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